What is Claimed is:

1. An information recording medium on which data of three or more values are recorded:

the data being recorded as a displacement of one of a groove, a groove wall, a mark and a mark wall in response to a modulation signal;

the modulation signal being produced from a band-limited signal produced by suppressing a dc component and high frequency components of a data string signal of a broad frequency band, whose value is changed over among three or more values in response to a value of the data, within a range within which intersymbol interference does not occur between adjacent data.

2. An information recording medium according to claim 1, wherein the modulation signal is produced by frequency converting the band-limited signal with a predetermined carrier signal, and the frequency of the carrier signal is set to a frequency equal to or higher than one half a frequency band to which the data string signal is band-limited.

3. An information recording medium according to claim 2, wherein the modulation signal is a signal obtained by quadrature amplitude modulation of the data string signal or a signal obtained by QAM modulation of

the data.

4. An information recording medium according to claim 1, wherein the groove or the mark has an inner circumference side wall face and an outer circumference side wall face displaced with data independent of each other so that different data from each other are recorded on the inner circumference side wall face and the outer circumference side wall face.

5. An information playback apparatus wherein a laser beam is irradiated upon an information recording medium and returning light is received and processed to play back data recorded on the information recording medium, the information recording medium having the data recorded thereon such that one of a groove, a groove wall, a mark and a mark wall is displaced with a modulation signal produced by suppressing a dc component and high frequency components of a data string signal of the data within a range within which intersymbol interference between adjacent data does not occur, said information playback apparatus comprising:

detection means for detecting the displacement of the one of the groove, groove wall, mark and mark wall with respect to the track center and outputting a detection result; and

decoding means for processing the detection result to play back the data of three or more multi-values.

6. An information playback apparatus according to claim 5, wherein said decoding means includes integration means for integrating the detection result and outputting an integration result, frequency characteristic correction means for correcting a frequency characteristic of the integration result, and demodulation means for quadrature amplitude demodulating or QAM demodulating an output signal of said frequency characteristic correction means.

7. An information playback apparatus according to claim 5, further comprising tracking control means for selectively irradiating the laser beam upon one of wall faces of the groove or mark.

8. An information playback apparatus according to claim 5, wherein the detection result by said detection means is a tangential push-pull signal.

9. An information playback apparatus according to claim 5, wherein said detection means detects a variation of a polarization plane of the returning light and outputs the detection result.

10. An information playback method wherein a laser beam is irradiated upon an information recording medium

and returning light is received and processed to play back data recorded on the information recording medium, the information recording medium having the data recorded thereon such that one of a groove, a groove wall, a mark and a mark wall is displaced with a modulation signal produced by suppressing a dc component and high frequency components of a data string signal of the data within a range within which intersymbol interference between adjacent data does not occur, the information playback method comprising:

a displacement detection step of detecting the displacement of the one of the groove, groove wall, mark and mark wall with respect to the track center; and

a decoding step of processing the detection result of the displacement to play back the data of three or more multi-values.

11. An information playback method according to claim 10, wherein the decoding step includes:

a step of integrating the detection result and outputting an integration result;

a frequency characteristic correction step of correcting a frequency characteristic of the integration result; and

a step of quadrature amplitude demodulating or QAM

demodulating an output signal by the frequency characteristic correction step.

12. An information recording apparatus for irradiating a laser beam upon an information recording medium to record data on a track of the information recording medium, comprising:

modulation means for producing a modulation signal from a band-limited signal produced by suppressing a dc component and high frequency components of a data string signal of a broad frequency band, whose value is changed over among three or more values in response to a value of the data, within a range within which intersymbol interference does not occur between adjacent data; and

optical means for displacing the laser beam in a direction transverse to the track in response to the modulation signal.

13. An information recording apparatus according to claim 12, wherein said modulation means includes:

multi-value signal production means for producing the data string signal;

band limiting means for band limiting the multi-value signal; and

frequency conversion means for frequency converting an output signal of said band limiting means with a

predetermined carrier signal;

the carrier signal having a frequency set to a frequency equal to or more than one half the frequency band.

14. An information recording apparatus according to claim 12, wherein said modulation means quadrature amplitude modulates or QAM modulates the data string signal to produce the modulation signal.

15. An information recording method for irradiating a laser beam upon an information recording medium to record data on a track of the information recording medium, comprising:

a modulation step of producing a modulation signal from a band-limited signal produced by suppressing a dc component and high frequency components of a data string signal of a broad frequency band, whose value is changed over among three or more values in response to a value of the data, within a range within which intersymbol interference does not occur between adjacent data; and

a step of displacing the laser beam in a direction transverse to the track in response to the modulation signal.

16. An information recording medium on which data are recorded as a displacement of one of a groove, a

groove wall, a mark and a mark wall:

where the average distance between adjacent grooves, adjacent groove walls, adjacent marks and adjacent mark wall faces is represented by D, the numerical aperture of an optical system for playing back the data by NA and the wavelength of a laser beam by said optical system by λ, the average distance, the numerical aperture and the wavelength are set so as to satisfy the following expression:

$$0.44 < \frac{D}{\frac{\lambda}{NA}} < 0.60$$

17. An information recording medium according to claim 16, wherein the displacement of the one of the groove, groove wall face, mark and mark wall face is formed in accordance with a modulation signal, and the modulation signal is produced from a band-limited signal produced by suppressing a dc component and high frequency components of a data string signal of a broad frequency band, whose value is changed over among three or more values in response to a value of the data, within a range within which intersymbol interference does not occur between adjacent data.

18. An information recording medium according to claim 17, wherein the modulation signal is produced by frequency converting the band-limited signal with a predetermined carrier signal, and the frequency of the carrier signal is set to a frequency equal to or higher than one half a frequency band to which the data string signal is band-limited.

19. An information recording medium according to claim 18, wherein the modulation signal is a signal obtained by quadrature amplitude modulation of the data string signal or a signal obtained by QAM modulation of the data.

20. An information recording medium according to claim 16, wherein the groove or the mark has an inner circumference side wall face and an outer circumference side wall face displaced with data independent of each other so that different data from each other are recorded on the inner circumference side wall face and the outer circumference side wall face.

21. An information playback apparatus, comprising:

an optical system for irradiating a laser beam of a wavelength upon an information recording medium;

a light receiving element for receiving returning light from the information recording medium;

means for processing a signal from said light receiving element to play back data recorded on the information recording medium;

said light receiving element having first and second light receiving faces for receiving the returning light which are juxtaposed in a direction along which a track extends across a line extending in a direction transverse to the track;

arithmetic operation means for outputting a difference signal of results of light reception of said first and second light receiving faces of said light receiving element; and

demodulation means for processing the difference signal to demodulate the data;

where the track pitch of the information recording medium is represented by D, the numerical aperture of said optical system by NA and the wavelength of the laser beam by λ, the track pitch, the numerical aperture and the wavelength are set so as to satisfy the following expression:

$$0.44 < \frac{D}{\frac{\lambda}{NA}} < 0.60$$

22. An information playback apparatus according to claim 21, wherein the information recording medium has the data recorded thereon as one of a displacement of a groove, a displacement of a groove wall, a displacement of a mark and displacement of a mark wall formed on the track, and further comprising a tracking control mechanism for controlling said optical system for tracking so that a beam spot by the laser beam may scan the track.

23. An information playback apparatus according to claim 21, wherein said demodulation means includes integration means for integrating the difference signal, and frequency characteristic correction means for correcting a frequency characteristic of the difference signal.

24. An information playback apparatus according to claim 21, wherein said demodulation means demodulates the data by quadrature amplitude modulation decoding means.

25. An information playback apparatus according to claim 21, wherein said demodulation means demodulates the data by QAM demodulation means.

26. An information playback method for irradiating a laser beam of a wavelength through an optical system upon an information recording medium on which data are

recorded as a displacement of one of a groove, a groove wall face, a mark and a mark wall face and receiving returning light from the information recording medium to play back data recorded on the information recording medium, comprising:

a step of receiving the returning light by means of first and second light receiving faces of said light receiving element which are juxtaposed in a direction along which a track extends across a line extending in a direction transverse to the track and producing a difference signal of results of the light reception by said first and second light receiving faces; and

a step of processing the difference signal to demodulate the data;

where the average distance between two adjacent grooves, adjacent groove walls, adjacent marks and adjacent mark wall faces is represented by D, the numerical aperture of said optical system by NA and the wavelength of the laser beam by λ, the average distance, the numerical aperture and the wavelength are set so as to satisfy the following expression:

$$0.44 < \frac{D}{\frac{\lambda}{NA}} < 0.60$$